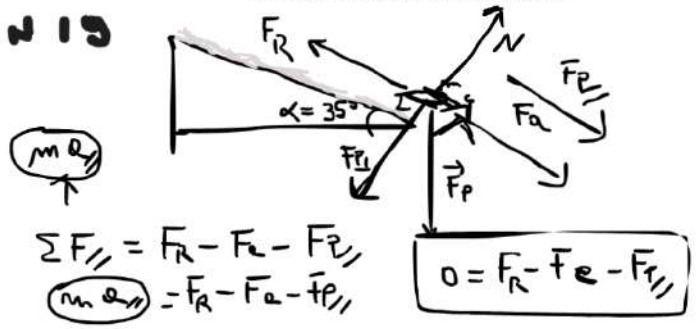
LEZIONE 11

Ultimi concetti sulla dinamica del punto materiale

N 19



$\alpha = 35°$

$m = 5{,}8\ kg$

$\mu_d = 0{,}2$

$F_R = ?$ verso $\Rightarrow a = 0$

$\Sigma F_{//} = F_R - F_a - F_{P//}$

$m a_{//} = F_R - F_a - F_{P//}$

$0 = F_R - F_a - F_{P//}$

$-F_R = -F_a - F_{P//} \rightleftharpoons F_R = F_a + F_{P//}$

$F_R = \mu_d N + mg \sin\alpha$

$F_R = \mu_d \cdot mg \cos\alpha + mg \sin\alpha$

$F_R = mg(\mu_d \cos\alpha + \sin\alpha) =$

$= (5{,}8\ kg)(9.81\ \frac{m}{s^2})(0{,}2 \cdot \cos 35° + \sin 35°) =$

$= 56{,}898\ N \cdot (0{,}737) = 41{,}93\ N \simeq 42\ N$

$\Sigma F_\perp = 0$

$= N - F_{P\perp} = 0$

$N = mg \cos\alpha$

$F = ?$

$a_{//} = 1{,}1 \frac{m}{s^2}$

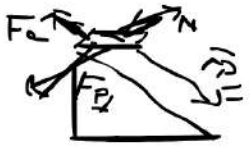
$\Sigma F_{//} = m a_{//} = F_R - F_a - F_{P//}$

$F_R = m a_{//} + F_a + F_{P//}$

$F_R = m a_{//} + \underbrace{\mu_d m g \cos\alpha + m g \sin\alpha}_{42N}$

$F_R = 42\,N + (5{,}8 Kg) \cdot (1{,}1 \frac{m}{s^2}) = 42N + 6{,}38N = 48{,}3N$

$\simeq \underline{48N}$



$$\sum \bar{F}_{//} = F_{p//} - F_a$$

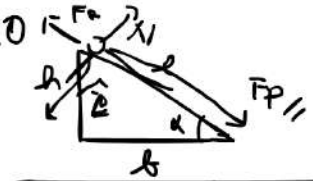
$$\cancel{m}a_{//} = \cancel{m}g\operatorname{sen}\alpha - \mu_d \cancel{m} g\cos\alpha$$

$$a_{//} = g\left(\operatorname{sen}\alpha - \mu_d \cos\alpha\right)$$

$$a_{//} = 9.81 \frac{m}{s^2}\left(\operatorname{sen} 35^\circ - 0{,}2\cos 35^\circ\right) =$$

$$= 9.81 \frac{m}{s^2} \cdot 0{,}41 = 4{,}02 \frac{m}{s^2} \simeq 4 \frac{m}{s^2}$$

N 20



$$\operatorname{sen}\alpha = \frac{h}{l} \qquad \cos\alpha = \frac{b}{l}$$

$$\operatorname{sen}\alpha = \frac{\sqrt{l^2 - b^2}}{l}$$

$l = 1{,}2\ m$

$b = 0{,}9\ m$

$a_{//} = 7{,}1\ \frac{m}{s^2}$

$\mu_d = ?$

$$h = \sqrt{l^2 - b^2}$$

$$\operatorname{tg}\alpha = \frac{\operatorname{sen}\alpha}{\cos\alpha} = \frac{\frac{\sqrt{l^2 - b^2}}{l}}{\frac{b}{l}} = \frac{\sqrt{l^2 - b^2}}{b}$$

$$m a_{//} = F_{p//} - F_a = m g \sin\alpha - \mu_d m g \cos\alpha$$

$$a_{//} = g \sin\alpha - \mu_d g \cos\alpha$$

$$\mu_d g \cos\alpha = g \sin\alpha - a_{//}$$

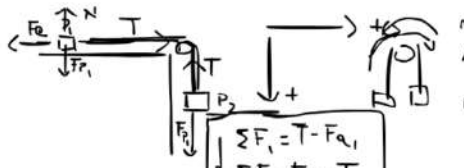
$$\mu_d = \frac{g \sin\alpha - a_{//}}{g \cos\alpha} = \frac{g \sin\alpha}{g \cos\alpha} - \frac{a_{//}}{g \cos\alpha}$$

$$\mu_d = \operatorname{tg}\alpha - \frac{a_{//}}{g \cos\alpha} = \frac{\sqrt{l^2 - b^2}}{b} - \frac{a_{//}}{g \frac{b}{l}} = \frac{\sqrt{l^2 - b^2}}{b} - \frac{l a_{//}}{b g}$$

$$\mu_d = \frac{\sqrt{(1,2m)^2 - (0,9m)^2}}{0,9m} - \frac{1,2m \cdot 3,1 \frac{m}{s^2}}{(9,81 \frac{m}{s^2})(0,9m)}$$

$$\mu_d = \frac{0,793 \cancel{m}}{0,9 \cancel{m}} - \frac{3,72 \frac{\cancel{m^2}}{\cancel{s^2}}}{8,829 \frac{\cancel{m^2}}{\cancel{s^2}}} =$$

$$= 0,88 - 0,421 = 0,459 \simeq 0,46$$



$m_1 = 4,5\ Kg$
$\mu_s = 0,75$
$\mu_d = 0,6$
$m_2 = ?$

$$\begin{cases} m_1 a_1 = T - \mu_d N = T - \mu_d m_1 g \\ m_2 a_2 = m_2 g - T \end{cases} \Longrightarrow \begin{cases} m_1 a_1 = T - \mu_d m_1 g \\ m_2 a_2 = m_2 g - T \end{cases}$$

$a_1 = a_2 = a$

$$\begin{cases} m_1 a = T - \mu_d m_1 g \\ m_2 a = m_2 g - T \end{cases}$$

3 INCOGNITE IN UN SISTEMA DI 2 EQUAZIONI !!! RISULTATO NON NUMERICO

$$m_1 a + m_2 a = -\mu_d m_1 g + m_2 g$$

Sommo MEMBRO A MEMBRO

$$(m_1 + m_2) a = g(-\mu_d m_1 + m_2)$$

$$a = \frac{(m_2 - \mu_d m_1)}{m_1 + m_2} g$$

GIUSTO L'ACCELERAZIONE È FUNZ. DI m_2

$$0 = (a) = \frac{(m_2 - \mu_s m_1)}{m_1 + m_2} \cdot g$$

$$0 = \frac{(m_2 - \mu_s m_1)}{m_1 + m_2}$$

SE È TUTTO VERO

$m_2 = \mu_s m_1 = 0,75 \cdot 4,5\ Kg = 3,37\ Kg \rightarrow 3,4 Kg$

$m_2 > \mu_s m_1$

PER

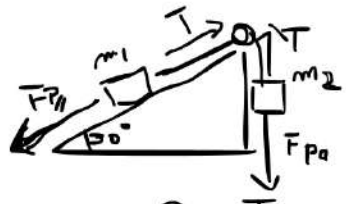
$m_2 = 3,4\ Kg$

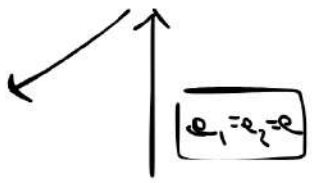
$m_2^* = 2 m_2 = 6,8 Kg$

$$\begin{cases} m_1 a = T - \mu_d m_1 g \\ m_2^* a = m_2^* g - T \end{cases}$$

$T = ?$ $a = ?$

A CASA FINIRE I CALCOLI





$\alpha = 30°$
$m_1 = 12\ Kg$
$a = 0{,}2\ \frac{m}{s^2}$
$T = ?$
$m_2 = ?$

① $\begin{cases} \Sigma \bar{F}_1 = \bar{F}_{P_{//}} - T \\ \Sigma \bar{F}_2 = F_{P_2} + T \end{cases}$

$\begin{cases} m_1 a_1 = m_1 g \sin\alpha - T \\ m_2 a_2 = T - m_2 g \end{cases}$

$$\begin{cases} m_1 a = m_1 g \operatorname{sen}\alpha - T \\ m_2 a = T - m_2 g \end{cases}$$

$$m_2 = \frac{56{,}2\ N}{9{,}2\frac{m}{s^2} + 9.81\frac{m}{s^2}}$$

$$m_2 = 5{,}61\ kg$$

$$T = m_1 g \operatorname{sen}\alpha - m_1 a =$$

$$= 12\ kg\left(9.81\frac{m}{s^2}\right) \operatorname{sen} 30° - 12\ kg \cdot 0{,}2\frac{m}{s^2}$$

$$T = 58{,}86\ N - 2{,}4\ N = 56{,}2\ N$$

$$T = m_2 a + m_2 g \Rightarrow m_2 (a+g) = T \quad m_2 = \frac{T}{a+g}$$